MODIS SCIENCE TEAM MEMBER
Semi-Annual Report   (January - June 1994)

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Contract #: NAS5 31365

Summary of Major Achievements during the Reporting Period:

- Development and documentation of the 6S radiative transfer code.
- Analysis of SCAR-A MAS, TM and AVHRR data for MODIS atmospheric correction algorithm
- Development of LTER collaboration on Atmospheric Correction
- Planning for SCAR- C Fire Campaign
- AVHRR Fire Detection Analysis (Africa)
- Integration of MODIS Test Sites into the Landsat Pathfinder Global Land Cover Test Site Project.
- ATBD Review Preparation and Presentation

a) Task Objectives

The objectives of this phase of the project were: to continue the research program developing the 'at-launch' algorithms for MODIS atmospheric correction, vegetation indices, fire detection and land cover and to build the infrastructure and collaboration to permit the research to be undertaken. The project has developed a number of collaborative projects which are intended to expand the scope of the team members activities and involve a larger community in the MODIS research. Due to the small number of researchers addressing the issues necessary for the methodological advances needed for MODIS, emphasis has been given to developing international collaborative research through the IGBP Data and Information System Core Project. In addition, the goals of the MODIS project, the status of the instrument and preliminary results of the research were presented at key scientific meetings. The project was also represented at the MODIS Team meeting. Results of the studies undertaken as part of the project are in the process of being written up and submitted for publication.

b) Tasks Accomplished (Data analysis and interpretation).

Specifically the project has addressed the following topics over the last six months:

MODIS atmospheric correction:

-Development of the 6S code: Version 3.1 is now ready for delivery. The code has been analyzed using a Fortran analyzer available on a Cray Computer (charney) and has been checked for portability on various Unix platforms. Version 3.1 is therefore three time faster than Version 3.0. A manual has been written for 6S (177 pages), and a postscript version of this manual is available by anonymous ftp (kratmos.gsfc.nasa.gov). An X-windows interface for 6S has been developed in collaboration with Louis Gonzalez from Lille (LOA).

MODIS Airborne Simulator:

-Absolute calibration and intercalibration methods have been developed for the MAS SCAR-A data sets to overcome the calibrated data delivery delay problems at MCST. For example the calibrated data for SCAR A 1992 are not yet available. The approach of this in-house calibration is to apply the method developed for the AVHRR by Vermote and Kaufman, 1994 (ie. absolute calibration from Rayleigh scattering and intercalibration using clouds and sunglint). This calibration has been validated by comparison of recalibrated data to AVIRIS calibrated data: results are generally in good agreement (0%-5% differences) except in the near-infrared (0.87μm) where an identified difference of 20% is being investigated.
- Further analysis of the MAS data has been performed. Retrievals of aerosol optical depths (within ±0.03 of sun photometer measurements) have been achieved on SCAR-A datasets using the 2.14μm channel to detect dark targets. The thermal split window technique (T4-T5) has been refined for application over land and validated against sun photometer measurements.
-Several meetings were held to define the MAS configuration for the BOREAS experiment and to prepare for the SCAR-C experiment (September 1994).

Sunphotometer Network Atmospheric Correction Validation:

-A proposal to NASA on LTER Atmospheric Correction was completed. This proposal will augment the MODIS pre-launch R&D activity and will exercice the operational atmospheric correction

method on AVHRR and TM data using LTER located sun-photometer data as the validation. It is linked to the MODIS test site concept and a proposal using the corrected data for FPAR analysis is being written by Running and al.
- Four TM scenes acquired during the SCAR-A experiment have been processed and analysed. Calibration has been investigated by comparison to calibrated AVIRIS data. The method implies co-registration of TM and AVIRIS images and reconstruction of the TM signal combining AVIRIS bands to approximate the TM spectral bands. A first version of an atmospheric correction module for TM has been developed.for use in the LTER study framework

MODIS Land Cover:

- Dr Justice attended the IGBP-DIS Working Group Meeting on Land Cover at Las Vegas and presented material on the MODIS Land Cover Test Site initiative and on Land Cover Validation options.
- The Modis Land Cover Test Site (GLCTS) initiative has been integrated as part of the Landsat Pathfinder Global Land Cover Test Site Project. The Phase 1 data product for the GLCTS has been prototyped at EDC for the H.J.Andrews LTER site. The product will include sample MSS and TM data, coregistered daily AVHRR data, the best available DEM and land cover information. Dr Warren Cohen is the site PI for the H.J. Andrews test site. We are currently evaluating this prototype product.
- A land cover validation working group has been established by the IGBP DIS, a meeting is planned for September in the UK.

MODIS Fire Detection:

- The first AVHRR global fire product was generated by SDST using the first ten days of the IGBP AVHRR Global 1km data from the LP DAAC and the algorithm developed for use with the AVHRR. This algorithm is a precursor to the Modland Fire Algorithm. The global product is now being evaluated.
- A precursor AVHRR fire product has been developed using a years worth of daily 1km data from Africa, South of the Equator. These data are being combined within an emissions model to generate trace gas and particulate emissions for the region for the 1989 burning season. Three joint papers were written with Dr R. Scholes from S. Africa for submission to the SAFARI Edition of the JGR.
- A field data collection visit was made to Southern Africa in June to provide preliminary calibration of AVHRR fire data.

- Discussions were held with Dr L. Flynn from the Mouginnis Mark IDS project to participate in the development of the MODIS fire algorithm. A subcontract is being developed for him to participate in the SCAR C experiment in September.
- A paper was

MODIS Vegetation Index

- A proposal was developed and submitted to EOSDIS to provide the capacity for SeaWifs product generation. This product will permit the testing of the MNDVI being proposed for MODIS.
- Dr A. Huete visited GSFC to discuss the planning for algorithm delivery in October. Discussion was held concerning the interdependency of the VI products with atmospheric correction and BRDF.
- Discussion was held with A. Fleig and R. Wolf concerning the developments re. the timing of the detectors at different spatial resolutions. Discussion was also held concerning the possibility of compositing the VI's using unresampled data.

c) Data / Analysis / Interpretation

Continued analyses of AVHRR, MAS and Landsat TM data were performed as part of the MODLAND prototyping effort.

Meetings Attended.
- Val d'Isere Spectral Signatures Meeting (Jan uary)
- Modland BRDF- VI- Atmospheric Correction Interactions Meeting (January).
- LP DAAC Visit to discuss Global 1km data release (February)
- IGBP Land Cover Working Group Meeting (February).
- Scar C Planning Meeting (February).
- Landsat Pathfinder Test Global Land Cover Test Site Meeting (March)
- Pathfinder Interuse Meeting (March)
- IGBP START SAF Meeting (June)
- AGU Spring Meeting in Baltimore (May)

d) Anticipated Future Actions.

Research:
Review ATBD Panel comments and respond.

Continued AVHRR Fire algorithm study: assessment of the Global Fire prototype, involvement in SCAR C, development of collaborative MODIS simulation project with the University of Hawaii.
Continued AVHRR Land Cover study.
Continued MODIS Airborne Simulator (MAS) analysis

Upcoming Meetings:

Carbonaceous Aerosol Workshop (Aug)
Biomass Burning Interagency Strategy Meeting (Dec)
Modis Simulation Data Set meeting (Sept)
Modis Rep. at the DAAC Science Advisory Panel (Sept)
IGBP-DIS Land Cover Validation Working Group (Sept)
European Symposium on Satellite Remote Sensing (Sept)

Hardware Purchase
1. Power MacIntosh, MacIntosh Quandra, 16MB Memory Expansion Kit, MacQuandra VRAM Expansion Kit, Apple Multiple Scan 20" Display Apple Adjustable Keyboard, Apple Ethernet Thin Coax Transceiver and Apple Color One Scanner w/ Accessory Kit. COST:$21,701.

2. Supra Fax Modem. COST:$250.

3. HP 720 (second hand). COST: $11,903.76

4. CPU Board Upgrade for HP 720 Workstation. COST:$9,188. (ordered not received yet)

e) Problems/Corrective Actions

Nothing to report

f) New Papers

Vermote, E. F., El Saleous, N. Z., Kaufman, Y. J. and Dutton, E., Stratospheric aerosol perturbing effect on the remote sensing of vegetation: Correction method for the composite NDVI after the Pinatubo eruption. (Submitted in March to special issue of RSE).

Roger, J. C. and Vermote, E. F., Computation and use of the reflectivity at 3.75mm from AVHRR channels. (Submitted in March to special issue of RSE).

E. Vermote and Y.J. Kaufman, 'Absolute calibration of AVHRR visible and near infrared channels using ocean and cloud views'. (Submitted in Feb to Int. J. Rem. Sens).

C. Justice, J. Kendall, P. Dowty and R.Scholes Satellite remote sensing of fires during the SAFARI Campaign using NOAA AVHRR data (Submitted to JGR)

Scholes R.J., Ward D. and Justice C.O. Emissions of trace gases and aerosol particles due to vegetation burning in Southern Africa (Submitted to JGR)